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TITLE: METHOD AND DEVICE FOR VERIFYING FEE PAYMENT

5 AREA OF INVENTION

The present invention relates to a method and device for paying a fee for a service and for verifying that the fee has been paid. The service fee may be a parking fee, a prepaid ticket, voucher, pay as you go, etc.

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BACKGROUND OF INVENTION

In order to pay for parking, presently, parking meters and parking automates are used. A parking meter is a device located adjacent the parking place and intended for receiving coins. When coins are inserted, a meter dial is advanced and then counts down a time corresponding to the payment time. A parking automate is arranged to deliver a paper parking ticket indicating the prepaid time to be placed visible inside the car, for example behind the windscreen. A parking automate may also accept credit card and issues a ticket indicating that a credit card has been used. When the parking is over, the user insert the credit card a second time, and the parking fee is debited the credit card account.

25 Such parking meters and automates have the drawback that they require a high investment cost and are prone to vandalism and tampering.

Another method of parking fee payment is payment to parking guards, for example in a parking house. Such manual payment is, however, expensive since it requires employment of persons for handling the payment and for issue of tickets. As a large part of payments are in cash, pilfering is also a problem.

Some parking fees are prepaid via vouchers allowing parking for a certain time period. Such vouchers may be

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forged and may be reused illegally. It is difficult to make such vouchers safe.

For parking places that are free, but the parking time is restricted to e.g. two hours, parking indicators
5 can be used, indicating the time of arrival by an index that can be adjusted to the arrival time.

There are also In Car Parking Meters (ICPM) that comprises a safe electronic timer that is preloaded with parking payment money. The timer is counted down during the
10 parking time. However, the ICPM is expensive and can easily be manipulated. It is also prone to theft. One example of an ICPM is disclosed in EP-1 126 418.

Parking may be paid for by means of mobile telephones. The mobile telephone is used to call a service
15 central and a parking payment is started. The payment is ended by a new telephone call and the parking time is debited a credit card associated with the telephone or debited the mobile telephone account. This service is relatively expensive, since it involves several mobile
20 telephone calls and possible transaction fees of the operator and the bank. Moreover, a controller needs a communication equipment in order to verify the parking in relation to the service central.

There are also parking allowances, for example for
25 handicapped or sick people. Such documents can easily be forged and stolen.

A problem with the above-mentioned methods is that the systems are relatively inflexible because they must be constructed and arranged so that forgery and theft is
30 avoided.

DISCLOSURE OF THE INVENTION

Thus, a first object of the invention is to provide a system that is flexible and can be adapted to all the
35 above-mentioned situations.

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A second object of the invention is to provide a system that is inexpensive as to the parts that can be exposed to theft.

5 A third object of the invention is to provide a system that is difficult to forge and that is easy to use for the user.

The invention is based on an electronic communication unit that comprises a memory that can be loaded with a message to the fact that a fee has been paid. The message
10 comprises identification information about a receiver intended for receiving said message.

The receiver may be a controller that wants to check if the fee has been duly paid. The receiver uses a receiver terminal that communicates with said communication unit,
15 preferably wirelessly. The receiver terminal receives only the message having the identification information relevant for said receiver terminal. The receiver terminal may read the message, and in certain cases also modify or erase the message, but only the message with the corresponding
20 identification information.

The communication unit is loaded by means of a personal terminal, that may be connected to the communication unit. The personal terminal loads a message on the communication unit and signs it by a cryptographical
25 method so that the message cannot be tampered with.

By the signature, the identity of the personal terminal can be defined.

BRIEF DESCRIPTION OF THE DRAWINGS

30 Further objects, features, and advantages of the invention will appear from the following detailed description of an exemplifying embodiment of the invention with reference to the drawings, in which:

Fig. 1 is a schematic block diagram of a
35 communication unit according to the invention;

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Fig. 2 is schematic block diagram of a receiver terminal to be used in the system of the invention;

Fig. 3 is a schematic block diagram of a personal terminal to be used in the system of the invention.

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DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

A communication unit 1 (called COM below) to be used in the present invention is disclosed in Fig. 1. COM 1 comprises a memory 2 connected to a control unit 3. The control unit 3 is further connected to a radio unit 4 for wireless communication with a receiver terminal, and a connector unit 5 for wirebound communication with a personal terminal via a connector 6. A battery 7 provides power for the components, COM 1 may include indicators 8 in the form of LED:s or a display panel in order to indicate operation or other parameters.

COM 1 may be a passive device requiring power only at certain activities.

The control unit 3 controls the activity of COM 1. The control unit also controls the power from the battery 7 so as to save battery power as much as possible.

COM 1 is designed so as to be as cheap as possible. Thus, the control unit 3 may be arranged as a logic array or custom made integrated circuit with specific operations only.

Fig. 2 discloses a receiver terminal according to the invention. The receiver terminal 20 is more or less a standard portable computer device and comprises a CPU 21 powered by a battery 22. A control unit 23 controls certain operations. The CPU 21 is connected to a radio unit 24 adapted to communicate with the radio unit 4 of COM 1. Moreover, CPU 21 is connected to a memory 25 and a display 26. CPU 21 may also communicate with the Internet via an internet communication unit 27 and an external modem, such as a mobile telephone or a radio link.

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Fig. 3 discloses a personal terminal according to the invention. It has substantially the same structure as the receiver terminal and comprises a CPU 31 connected to a memory 35, a display 36, an Internet unit 37 and a control unit 33 and powered by a battery 32. Instead of the radio unit 24 of the receiver terminal, the personal terminal comprises a connector unit 34 and a connector 38 for connection with connector 6 of COM 1.

The operation of the system of the invention will be described below.

The personal unit 30 is connected to COM 1 by inserting the connector 6 of COM 1 in connector 38 of the personal unit 30. An alternative implementation would be to have the personal terminal communicate with COM 1 over the same interface as used for the receiver terminal. The personal unit is controlled by a program in the memory 35 and/or by the control unit. The personal unit designs a message to be loaded in the memory of COM 1. The message may be: "2004-12-10, time 13.10, my car, Volvo 744, blue sedan, Reg. no. AXD 753 was parked in zone 6. I paid by debiting my prepaid parking account at personal terminal No. 1456743 for two hours parking." The message is addressed to "All car-park attendants of the parking unit of the City of X"

The message is signed by the personal terminal in order to verify that it has been delivered by a certified terminal. Moreover, it is protected against amendment by use of codes, secret information, encryption or cryptographic signatures, for example by one or several cryptographic methods. Methods of signature and cryptation are well-known by the skilled person.

The message could also be marked with the identity of the vehicle, in order to protect against theft of the personal terminal.

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The personal unit may load further messages to COM 1, depending on the circumstances. Such messages may be for different recipients and for different purposes.

The personal unit includes a program that is
5 authorised to debit an account with the parking fee, alternatively confirm the prepayment of this fee through other payment means, or secure the future payment of same fee and confirm this arrangement, and issue the relevant message. The message is a replacement for the parking
10 ticket that is attached to the windscreen in a conventional system. The personal terminal can contain a Secure Application Module (SAM) to secure the payment, and it could integrate the connector for the payment card, electronic purse or other.

15 In order to secure the prepaid values and the cryptographical signatures, all actions can take place in a secure processor which can be implemented in analogy with a SAM (Secure Application Module) according to EMV (Europay MasterCard Visa Electronic Payment Protocol) or a SIM
20 (Subscriber Identification Module) according to GSM (Global System for Mobile telephony).

The personal terminal may be a terminal owned by the user. Alternatively, the personal terminal may be a parking automat that the user uses for paying the parking fee.
25 Instead of issuing a parking ticket, the automat issues a message and loads it at COM 1. Other means may also be contemplated.

The personal terminal as described above, was connected to the COM 1 via a connector. However, any means
30 for transferring the message to the COM 1 can be used, including a magnetic strip, radio waves, Internet, ultrasound, infrared or ordinary light, etc.

The personal terminal may have an identification number that is used in the exchange of information with

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COM 1 to ensure that the message is loaded by a specific personal terminal.

After COM 1 has been loaded with the relevant information message, COM 1 is arranged at a convenient
5 location in the car. Such location may be in the glove compartment or in a specific holder. COM 1 may be visible or invisible from outside of the car. COM 1 may also be integrated in the electronic system of the car, as one
10 component or as several networked sub components, as an integral part or as a part that may be separated from the system.

The receiver terminal 20 is arranged to poll COM 1 for messages intended for the specific receiver terminal 20. The receiver terminal 20 may be transported by a car-
15 parking attendant that wants to check if the owner of a certain car has paid the parking fee.

The receiver terminal is brought into vicinity of COM 1 located inside the car. The receiver terminal issues a wake-up command that is recognized by the control unit 3 of
20 COM 1. The control unit 3 activates the battery 7 and makes COM 1 ready to answer. The receiver terminal sends an identity code to COM 1 and the control unit 3 searches memory 2 for any message for the specified identity code. The above-mentioned message is found and transmitted to the
25 receiver terminal. The receiver terminal analyses the message and determines if it is a valid payment, by any means. The message, or part thereof, may be displayed at the display screen so that the attendant can verify that the car has the right registration number and further
30 characteristics. If everything is in order, the attendant continues to the next car. If the parking fee has not been properly paid, the attendant performs the same act as should have been done in a normal parking payment system, such as attaches a fine card at the car.

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In case the radio unit has a range of operation that is some 10 meters, such as Bluetooth[®] communication, the receiver unit may be arranged in a car that passes by the cars parked and checks the COM:s in each car more or less automatically. In this configuration the receiver unit and the COM 1 must be capable of handling the possible collision of communications from several COM 1 units in response to one contact request from the receiver unit.

The receiver terminal described above uses radio communication. However, other types of wireless communication may be used as well, such as ultrasound, infrared radiation, light radiation etc. However, the receiver unit communicates with COM 1 without the use of wires and connectors.

The receiver terminal may check the authority and identity of the message writer at place on-line via Internet or later when returning to the office.

Since the identity of the message writer is known, any fines may be debited the account of the writer via another channel, such as direct debit of a bank account.

The receiver terminal may annotate the message, for example add that it has been read by the specific receiver terminal and store the message at COM 1. In certain applications, the message may be cancelled or electronically annotated after being read, such as any single use token or ticket, e.g. payment for one car wash or one bridge fare, etc. There may be limitations on the additions allowed for each message, so that the memory of COM 1 cannot be overloaded.

The receiver terminal may poll all messages in the memory. However, only the message intended for the specific receiver terminal can be read and acted upon. Alternatively, only the message intended for the specific receiver terminal is transmitted by COM 1.

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COM 1 may be adapted to the application. Thus, the size of the memory 2, the type of control unit 3, and other components of COM 1 are arranged in accordance with the application. COM 1 may be arranged as a credit card in size
5 and may be manufactured very inexpensively. Thus, COM 1 is not exposed to theft.

The control unit 3 may be arranged as a gate array or an ASIC with a limited number of possible actions. Thus, it will be very robust and cannot be easily tampered with.

10 Alternatively, the control unit 3 may be a conventional Central Processing Unit, CPU, and safety measures may be included in software.

COM 1 may be a passive device that can be polled without using any power, or very little power. Then, COM 1
15 can be used over and over again without loss of battery. Only when the personal terminal stores a message, the power of the battery may be needed.

COM 1 may be integrated with the electronic system of the car, whereby COM 1 may be more sophisticated.

20 By logically connecting COM 1 to a certain car or to a specific personal terminal, COM 1 will not be possible to use by another personal terminal, and will be useless if stolen. Each COM 1 can have a unique identity in the system, thereby securing it against theft and misuse.

25 The messages in COM 1 may include several messages to several receiver terminals. One and the same message may be addressed to several receiver terminals. Several messages may be addressed to the same receiver terminal. In this way, different services may be integrated on the same COM
30 1. There may be complete confidentiality between the different services.

COM 1 may be a chip card that communicates according to ISO 14443 with the receiver terminal. The chip card may communicate with the personal terminal via ISO 7816, or
35 possibly by ISO 14443.

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The personal terminal may be a smart card reader working according to the standard ISO 7816. The personal terminal may include a time card for indicating proper time. Moreover, the personal terminal may include a
5 navigation system for determining the position of the card and car, such as a GPS (Global Positioning System). The personal terminal can have means for user data entry so that information such as the time to park, parking zone, time, and others, can be entered by the user.

10 The personal terminal may have a USB contact to be connected to a personal computer and further on to the Internet.

One alternative embodiment of the personal terminal could be to have it integrated completely or partially in
15 the fixed electronic and telematic system of the vehicle.

Several embodiments of the invention have been described above. A skilled person reading the present specification may find further combinations and
20 alternations and such are intended to be within the scope of the invention. The invention is only limited by the appended patent claims.

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